APPLICATIONS OF REMOTELY SENSED DATA FOR SEASONAL CLIMATE PREDICTIONS IN EAST ASIA AND SOUTHWEST UNITED STATES

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RESEARCH OBJECTIVES

The objectives of this study are to improve seasonal-to-interannual climate prediction by incorporating remotely sensed land-surface data into more realistic starting values for land-surface models. The improved climate predictions will provide input forcing to water resources, river flow, and agricultural productivity models, with climate variability represented. The modeling framework, methodology, and data obtained in this study will be applied toward advancing seasonal and interannual regional climate predictions and climate impact assessments for East Asia and Southwest United States.

APPROACH

We have generated improved land-surface data for snow-cover, soil moisture content, and vegetation by combining satellite-observed and station data in collaboration with the University of Arizona, NASA Data Centers, and East Asia institutions. Satellite data to be used includes NASA's Earth Observing System/Moderate Resolution Imaging Spectroradiometer, the National Oceanic and Atmospheric Administration's (NOAA) Advanced Very High Resolution Radiometer for snow cover and vegetation characteristics, and the Advanced Microwave Scanning Radiometer for soil moisture. Improved land-surface data is then used to initialize the Soil-Plant-Snow (SPS) model as coupled with the Mesoscale Atmospheric Simulation (MAS) model for dynamic downscaling. The SPS will be modified to examine the effects of different interpretations of satellite-observed surface data. The coupled MAS-SPS will be used to investigate the effects of improved land-surface data on regional simulations for seasonal and interannual time scales (see Figure 1). Predicted atmospheric data will be used to predict streamflow and agricultural production.

ACCOMPLISHMENTS

This new NASA IDS (Interdisciplinary Studies) project began in March 2000 and is a follow-on from our previous NASA IDS precipitation and streamflow hindcast project. Our preliminary investigation is focused on an evaluation of our Regional Climate System Model and the generation of data sets for this study. We have investigated the accuracy of the system and the large-scale forcing data. Simulations for the 1998 and 1999 East Asia monsoon season have been completed, using the large-scale analysis data sets from NOAA and the Korean Meteorological Agency. Additionally, an eight-year simulation for the western U.S has been completed and is being studied for the effects of vertically varying root density on warm-season regional climate. Fine-scale global vegetation data sets are being analyzed and processed to generate surface-vegetation-characteristic data for the SPS. We are also obtaining hydrologic data for several basins in China and Korea for streamflow research.

SIGNIFICANCE OF FINDINGS

We found a significant difference in the location and intensity of East Asian monsoon rain bands simulated with the two different large-scale data sets. We have completed a multiyear simulation of basin-scale precipitation and streamflow resulting in fair to good predictability of the mean monthly streamflow (Miller et al. 2001). These results imply a potential for dynamic downscaling applications related to water resources and agriculture in this region.

RELATED PUBLICATION

Miller, N., J. Kim, and J. Zhang, Coupled precipitation and streamflow simulations at the GAME/HUBEX site: Xixian Basin, J. Japan. Meteorol. Soc., 2001 (in press).

ACKNOWLEDGMENTS

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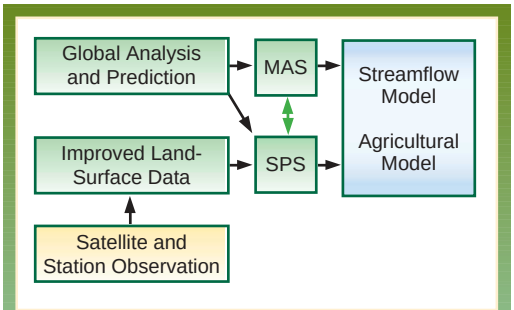

Figure 1. An outline of the regional-climate-prediction experiment in this study. Black arrows indicate one-way data flow; the green arrows indicate interactive coupling.